FORM PTO-1390 (Modified) (REV 11-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
112740-250	
U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	
09/914413	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/00538	25 February 2000	26 February 1999

TITLE OF INVENTION

METHOD FOR CONTROLLING THE DISTRIBUTION OF TRANSMISSION RATES IN A CELLULAR RADIO TELECOMMUNICATION SYSTEM,

APPLICANT(S) FOR DO/EO/US

Egon Schulz

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☒ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Submission of Drawings - Figures 1-2 on two sheets

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/914413	PCT/DE00/00538	112740-250

21. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO	$1,000.00
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but Internation Search Report prepared by the EPO or JPO	$860.00
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$710.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$690.00
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =	$860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	$0.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	23 - 20 =	3	x $18.00	$54.00	
Independent claims	1 - 3 =	0	x $80.00	$0.00	
Multiple Dependent Claims **(check if applicable)**.			☐	$0.00	
TOTAL OF ABOVE CALCULATIONS =				$914.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).** ☐				$0.00	
SUBTOTAL =				$914.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				$0.00	
TOTAL NATIONAL FEE =				$914.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐				$0.00	
TOTAL FEES ENCLOSED =				$914.00	
				Amount to be: refunded	$
				charged	$

☒ A check in the amount of **$914.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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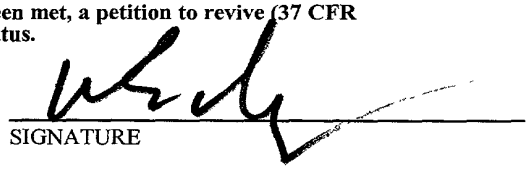

SIGNATURE

William E. Vaughan
NAME

39,056
REGISTRATION NUMBER

August 27, 2001
DATE

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANT:	Egon Schulz	DOCKET NO: 112740-250
SERIAL NO:		GROUP ART UNIT:
		EXAMINER:
INTERNATIONAL APPLICATION NO:		PCT/DE00/00538
INTERNATIONAL FILING DATE:		25 February 2000
INVENTION:	METHOD FOR CONTROLLING THE DISTRIBUTION OF TRANSMISSION RATES IN A CELLULAR RADIOTELECOMMUNICATION SYSTEM	

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In the Specification:

Please replace the Specification of the present application, including the Abstract, with the following Substitute Specification:

SPECIFICATION

TITLE OF INVENTION

METHOD FOR CONTROLLING THE DISTRIBUTION OF TRANSMISSION RATES IN A CELLULAR RADIOTELECOMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

In the field of telecommunication close to the terminal, radio links are increasingly gaining in importance. Cordless telephones, mobile radio terminals and the wireless "RLL" (Radio in the Local Loop) or "WLL" (Wireless Local Loop) line interfacing systems are known examples of this. An air interface known as "DECT"

(Digital Enhanced (previously European) Cordless Telephone) was defined on the initiative of European companies, with the aim of specifying a standard for a universal high-performance air interface. The DECT standard is described in the documents ETS (European Telecommunication Standard) 300 175-1, ..., 9 October 1992 of the ETSI (European Telecommunication Standards Institute) and is known from these.

A DECT system allows a maximum of 120 simultaneous connections between so-called fixed parts and portable parts by which, incidentally, is meant not only mobile terminals but, as for example in the case of the wireless line interface system "Radio in the Local Loop", also stationary system components communicating with a fixed part via air interface, which include the functionality of a portable part. In which system a maximum of 10 frequencies between 1.88 and 1.90 GHz are available and a maximum of 12 simultaneous duplex voice links (time slots, voice channels) can be implemented for each frequency.

The DECT standard also specifies interworking between DECT and "ISDN" (Integrated Services Digital Network). For this reason, time slots with a 64 kbit/s transmission rate, intended as support for ISDN, are also specified in addition to the time slots (channels) with 32 kbit/s ("Full Slots") and 8 kbit/s ("Half Slots") required for voice links.

Fixed parts and corresponding portable parts are generally known which support transmission rates of both 32 kbit/s "Full Slots" and 64 kbit/s "Double Slots" for the faster data transmission of, for example, 64 kbit/s or, respectively, for supporting DECT/ISDN interworking, which thus provide up to six channels with a transmission rate of 64 kbit/s; i.e., a maximum of two complete ISDN connections consisting of two "B channel" basic channels with 64 kbit/s each and one "D channel" control channel with 16 kbit/s.

These fixed parts are integrated into preexisting cordless telecommunication, RLL or WLL systems. Where there is a requirement for high transmission rates, particularly for packet data transmission, this integration is done by substituting fixed parts which support both 32 kbit/s time slots (full slots) and

64 kbit/s time slots (double slots) for the fixed parts which only provide time slots of 32 kbit/s. A problem arising with this procedure is the fact that fully functional fixed parts are removed from existing networks or radiotelecommunication systems even though their procurement costs have not yet been amortized in some cases.

After the substitution, the availability of full-slot connections and double-slot connections is guaranteed, in principle. However, if there is a large number of existing full-slot connections, the case may occur that requested double-slot connections cannot be implemented since, due to the existing full-slot connections, it is not possible to form time slots with 64 kbit/s transmission rate (double slot). In this case, channels for services having a requirement for high transmission rates, especially the transmission of packet data, can only be provided again when the number of existing full-slot connections has been reduced.

From US 4,748,681, a telecommunication system is known in which a fixed part is, in each case, operated in a radio cell. The radio cells in each case exhibit a multiplicity of different portable parts which need different services and the fixed part at least partially supports these different services and informs the portable parts via signaling of the services supported.

The present invention is directed toward specifying a method for controlling the distribution of transmission rates in a cellular radiotelecommunication system in which the radio transmission resources available in the radiotelecommunication system, especially with an RLL or WLL system, respectively, are effectively used.

SUMMARY OF THE INVENTION

Accordingly, in the method according to the present invention, a second fixed part which supports the first transmission rate is, in each case, additionally installed in the radio cell in a cellular telecommunication system having at least one radio cell with a first fixed part which supports a first low transmission rate and a second transmission rate and at least one portable part for purposes of cordless telecommunication, especially in accordance with the TDMA principle. The second fixed part signals the support of the first transmission rate in a first system

information item and the first fixed part signals the support of the second or of the first and second transmission rate depending on traffic.

The essential advantage of the method according to the present invention is the possibility of using the second fixed part exclusively for implementing connections having a low transmission rate and the first fixed part predominantly for implementing connections having a high transmission rate so that adequate supply with time slots of high transmission rate is guaranteed within the radio cell.

In a further embodiment, two lists are maintained in a portable part which supports both the first transmission rate for providing the first service and a second transmission rate for providing the second service. If it is signaled to a portable part in the system information item of a fixed part that the latter supports the first transmission mode, connection-related data, especially the identification of the fixed part, obtained from the system information are stored in a first list. If the fixed part signals to the portable part that it supports the second transmission mode, the connection-related data, especially the identification of the fixed part, are stored in a second list.

An advantage of this further embodiment is that the fixed parts are differentiated in accordance with the services provided in order to guarantee better utilization of the available services.

An essential advantage of further embodiments relating to both decentralized traffic-dependent control and centralized traffic-dependent control is the efficient utilization of the available services since the fixed part which supports services with high transmission rates is kept free of services with low transmission rates via suitable signaling.

An essential advantage of another embodiment is to keep the first fixed part free for telecommunication connections utilizing the second service by exchanging the telecommunication connection between the first fixed part and the portable part utilizing the first service against an equivalent telecommunication connection to the second fixed part.

An advantage of a further embodiment is time stabilization of the method since the hysteresis achieved via the threshold values prevents the system information from continuously flipping.

Another embodiment allows for the resultant possibility of use in a DECT system.

Yet another embodiments for the resultant possibility of use in a GSM system.

In another embodiment, the simple and inexpensive implementation of the method is effected since the exchange of telecommunication connections is performed without additional measurements and signaling operations.

An advantage of a further embodiment is an increase in the effective utilization of available services since the first fixed part is rapidly freed for telecommunication connections utilizing the second service with the second transmission rate, due to the rapid exchange of the telecommunication connections.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows two radio cells of a DECT system with, in each case, one portable part and two fixed parts and a higher-level controller.

Figure 2 shows a flowchart for controlling the traffic-dependent distribution of the transmission rates in fixed parts in the DECT system according to Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a telecommunication system constructed as a DECT system, with radio cells PC1 and PC2 constructed as picocells. Information is transmitted in each case via a DECT air interface designed in accordance with the DECT standard, via which the wireless "DECT radio channel" transmission medium is accessed by a combination of FDMA (Frequency Division Multiple Access), TDMA (Time Division Multiple Access) and TDD (Time Division Duplex) access methods. In this system, ten carrier frequencies with a channel spacing of, in each

case, 1.728 MHz (FDMA) are available in the frequency range between 1880 MHz and 1900 MHz, the time frame established per carrier being divided into 24 time slots or channels (also called "slots" (TDMA)).

During the transmission of voice data, DECT fixed parts FP11, FP12, FP21, FP22 use time slots with 32 kbit/s transmission rate (full slots), whereas time slots having a transmission rate of 64 kbit/s (double slots) are mainly used for the transmission of packet data by first DECT fixed parts FP11, FP21. A first DECT portable part PP21 uses full slots for transmitting voice data, whereas a second DECT portable part PP11 uses full slots for voice transmission and double slots for the transmission of packet data. The second DECT portable part PP11 stores data records from the DECT fixed parts FP11, FP12, FP21, FP22 which use full slots and the DECT fixed parts FP11, FP12, FP21, FP22 which use double slots, in the form of separate lists L1, L2 in a memory SP1, SP2. A controller FPC, which is connected to the DECT fixed parts FP11, FP12, FP21, FP22 via a line in order to control them in dependence on the traffic, is superordinate to the radio cells PC1 and PC2.

As an alternative, the connection between DECT fixed parts FP11, FP12, FP21, FP22 and the controller FPC also can be implemented via the DECT air interface.

The DECT system also can be implemented without controller; i.e., the traffic-dependent control is implemented by the fixed parts FP11, FP12, FP21, FP22.

The flowchart shown in Figure 2 illustrates the sequence of traffic-dependent control which takes place in the DECT system according to Figure 1 between a first DECT fixed part FP11, a second DECT fixed part FP12, the higher-level controller FPC and the DECT portable part PP11 within the picocell PC1 in dependence on a value FS of the traffic load which has been detected by the second DECT fixed part FP12.

In the initial state, the second fixed part FP12 signals to the second portable part PP11 in a second system information item that it supports full slots and the

first fixed part FP11 signals to the second DECT portable part PP11 in a first system information item that it supports double slots. Signaling is carried out in each case, for example, by setting and resetting flags.

If the second DECT portable part PP11 finds from the flag set or, respectively, reset in the first system information item that the first DECT fixed part FP11 supports a transmission mode M2 (i.e., use of double slots for transmitting, for example, packet data), the second DECT portable part PP11 stores connection-related data from this system information item, for example, among other things, the identification of the DECT fixed part FP11, in the form of a first list L1. If the second DECT fixed part FP12 signals to the second DECT portable part PP11 in the second system information item that it supports a transmission mode M1, i.e. full slots, for transmitting voice, the second DECT portable part PP11 stores connection-related data from this system information item, for example, among other things, the identification of the DECT fixed part, in the form of a second list L2. The lists L1, L2 are updated by a change in the system information items.

If the number FS of the full slots used by the second DECT fixed part FP12 is greater than or equal to a first threshold value FS_MAX which, together with a second threshold value FS_HY, is determined, e.g. centrally in an information and operation center, or locally in the relevant DECT fixed parts FP11, FP21, the second DECT fixed part FP12 sends a first signaling information item to the controller FPC. The first DECT fixed part FP11 is thereupon controlled by the higher-level controller FPC in such a manner that it signals in the first system information item directed to the second DECT portable part PP11 located in the radio cell PC1 that it supports both full slots and double slots. After having received this system information item, the second DECT portable part PP11 updates its list(s) L1, L2.

If the number FS is smaller than the first threshold value FS_MAX, the second DECT fixed part FP12 checks whether the number FS is less than the second threshold value FS_HY. If this is so, the second DECT fixed part FP12 sends a second signaling information item to the higher-level controller FPC. The

first DECT fixed part FP11 is thereupon controlled by the higher-level controller FPC in such a manner that it signals the support of double slots to the second portable part PP11. After having received this system information item, the second DECT portable part PP11 updates the lists L1, L2, if necessary. In addition, the controller FPC requests the first DECT fixed part FP11 to determine the number of existing full-slot connections (transmission mode M1) between the first DECT fixed part FP11 and the DECT portable parts PP11, PP21 and, if these exist, to report them. If there is at least one full-slot connection, the controller FPC can initiate the handover of a full-slot connection from the first DECT fixed part FP11 to the second DECT fixed part FP12 via the second DECT portable part PP11.

If the number is not less than the second threshold value FS_HY or if there is no full-slot connection between the first DECT fixed part FP11 and the second DECT portable part PP11, only the lists L1, L2 of the second DECT portable part are updated, as necessary, and the process recommences with the current number FS.

As an alternative to centralized control by the controller FPC, the traffic-dependent control also can be performed by the DECT fixed parts FP11, FP12, FP21, FP22 as already described with Figure 1. In this case, the second DECT fixed parts FP12, FP22 determine the current value of the number FS, perform the threshold value comparisons and signal the results to the first DECT fixed parts FP11, FP21. The first DECT fixed parts FP11, FP21 signal the corresponding transmission modes to the DECT portable parts PP11, PP21 and, if necessary, initiate a handover.

As an alternative to the iterative handover procedure of only one full-slot connection, a number of full-slot connections can be handed over in one step. The number of connections is limited, however, to such an extent that the first threshold value FS_MAX is not reached or exceeded by the handover.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made

thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

A method for controlling the distribution of transmission rates in a cellular radiotelecommunication system wherein, in order to support the effective utilization of types of time slot in wireless telecommunication systems, e.g. the DECT-specific "Full" or "Double Slots", two fixed parts are provided for each radio cell. The first fixed parts in each case support two types of time slot but signal in dependence on the capacity utilization of the second fixed parts, which only support one type of time slot, that they support the second or the first and second type of time slot. The portable parts store the fixed parts, after they have signaled their support of types of time slot, in separate lists.

IN THE CLAIMS

On page 11, cancel line 1, and substitute the following left-hand justified heading therefor:

CLAIMS

Please cancel claims 1-20, without prejudice, and substitute the following claims therefor:

21. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system, the method comprising the steps of:

operating, in at least one radio cell of the radiotelecommunication system, at least two fixed parts and at least one portable part for purposes of wireless telecommunication;

supporting, via a first of the at least two fixed parts, both a first transmission mode in which a first service is transmitted at a first transmission rate and a second transmission mode in which a second service is transmitted at a second transmission rate;

supporting, via a second of the at least two fixed parts, the first transmission mode in which the first service is transmitted at the first transmission rate;

signaling to the at least one portable part, via the first fixed part and in dependence on a traffic load carried by the second fixed part, in a first system information item that the first fixed part supports the second transmission mode and, possibly, also the first transmission mode; and

signaling to the at least one portable part, via the second fixed part, in a second system information item that the second fixed part supports the first transmission mode.

22. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, the method further comprising the steps of:

supporting, via the at least one portable part, both the first transmission mode in which the first service is transmitted at the first transmission rate, and the second transmission mode in which the second service is transmitted at the second transmission rate;

storing connection-related data in at least one memory via the at least one portable part;

storing primary data records in the form of a first list in the memory, via the at least one portable part, when the fixed parts signal in the system information items that the fixed parts support the first transmission mode;

storing secondary data records in the form of a second list in the memory, via the at least one portable part, when the fixed parts signal in the system information items that the fixed parts support the second transmission mode; and

updating both the first list and the second list, via the at least one portable part, in case of a change in system information from the fixed parts.

23. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, the method further comprising the steps of:

comparing a value of a current capacity utilization with threshold values via the second fixed part;

sending to the first fixed part, via the second fixed part, a first signaling information item when the value of the current capacity utilization is greater than or equal to a first threshold value;

sending to the first fixed part, via the second part, a second signaling information item when the value of the current capacity utilization is less than or equal to a second threshold value;

signaling, via the first fixed part, between receiving the first and the second signaling information items, to the at least one portable part in the first system information item that the first fixed part supports both the first transmission mode and the second transmission mode; and

signaling, via the first fixed part, between receiving the second and the first signaling information items, to the at least one portable part in the first system information item that the first fixed part supports the second transmission mode and, possibly, the first transmission mode.

24. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, the method further comprising the steps of:

comparing a value of a current capacity utilization with threshold values via the second fixed part;

sending to a higher-level controller, via the second fixed part, a first signaling information item when the value of the current capacity utilization is greater to or equal to a first threshold value;

sending to the higher-level controller, via the second fixed part, a second signaling information item when the value of the current capacity utilization is less than or equal to a second threshold value;

controlling the first fixed part, via the higher-level controller, between receiving the first and the second signaling information items, such that the first

fixed part signals to the at least one portable part in the first system information item that the first fixed part supports the first transmission mode and the second transmission mode;

controlling the first fixed part, via the higher-level controller, between receiving the second and the first signaling information items, such that the first fixed part signals to the at least one portable part in the first system information item that the first fixed part supports the second transmission mode and, possibly, the first transmission mode.

25. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 23, the method further comprising the step of:

exchanging telecommunication connections between the at least one portable part and the first fixed part, in which the first transmission mode is used, via a handover by corresponding telecommunication connections between the at least one portable part and the second fixed part.

26. A method for controlling a distribution of transmission rates in a cellular radiotelecommunicaton system as claimed in claim 25, wherein the telecommunication connections are exchanged when the second signaling information item is received, the telecommunication connections are exchanged automatically, and the exchange of telecommunication connections is ended, at the latest, after the first signaling information item has been received.

27. A method for controlling a distribution of transmission rates in a cellular radio telecommunication system as claimed in claim 26, wherein the at least one portable part initiates the exchange of, and exchanges, the telecommunication connections.

28. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 26, wherein the fixed parts initiate the exchange of, and exchange, the telecommunication connections.

29. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 24, the method further comprising the step of:

exchanging telecommunication connections between the at least one portable part and the first fixed part, in which the first transmission mode is used, via a handover by corresponding telecommunication connections between the at least one portable part and the second fixed part.

30. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 29, wherein the telecommunication connections are exchanged when the second signaling information item is received, the telecommunication connections are exchanged automatically, and the exchange of telecommunication connections is ended, at the latest, after the first signaling information item has been received.

31. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 30, wherein the higher-level controller initiates the exchange of, and exchanges, at the telecommunication connections.

32. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 25, wherein the telecommunication connections are exchanged in an iterative process.

33. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 25, the method further comprising the steps of:

signaling to the first fixed part a particular number of connections which can be handed over to the second fixed part without exceeding the first threshold value; and

handing over, in one step, from the first fixed part to the second fixed part, the particular number of connections.

34. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 32, the method further comprising the step of:

signaling, from the second fixed part to the first fixed part, a number of connections exchanged.

35. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 29, wherein the telecommunication connections are exchanged in an iterative process.

36. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 35, the method further comprising the steps of:

signaling the number of connections to the higher-level controller via the second fixed part; and

signaling the number of connections to the first fixed part via the higher-level controller.

37. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 23, wherein an

absolute value of the second threshold value is equal to an absolute value of the first threshold value.

38. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 23, wherein an absolute value of the second threshold value is smaller than an absolute value of the first threshold value.

39. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, wherein signals are transmitted at 32 kbit/s per second via the first transmission rate and at 64 kbit/s per second via the second transmission rate.

40. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, wherein voice is transmitted via the first service and packet data is transmitted via the second service.

41. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, wherein the at least one portable part is a wireless portable part.

42. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, wherein the at least one portable part is a wireless radio network termination.

43. A method for controlling a distribution of transmission rates in a cellular radiotelecommunication system as claimed in claim 21, wherein the radiotelecommunication system operates in accordance with a DECT standard.

REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached hereto is a marked-up version of the changes made to the specification by the present amendment. The attached page is captioned "**Version With Markings To Show Changes Made**".

In addition, the present amendment cancels original claims 1-20 in favor of new claims 21-43. Claims 21-43 have been presented solely because the revisions by crossing out and underlining which would have been necessary in claims 1-20 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§103, 102, 103 or 112. Indeed, the cancellation of claims 1-20 does not constitute an intent on the part of the Applicant to surrender any of the subject matter of claims 1-20.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Specification:

The Specification of the present application, including the Abstract, has been amended as follows:

~~GR 99 P 1301~~

~~Description~~

~~Method for controlling the distribution of transmission rates in a cellular radiotelecommunication system~~

SPECIFICATION

TITLE OF INVENTION

METHOD FOR CONTROLLING THE DISTRIBUTION OF TRANSMISSION RATES IN A CELLULAR RADIO TELECOMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

In the field of telecommunication close to the terminal, radio links are increasingly gaining in importance. Cordless telephones, mobile radio terminals and the wireless "RLL" (Radio in the Local Loop) or "WLL" (Wireless Local Loop) line interfacing systems are known examples of this. An air interface known as "DECT" (Digital Enhanced (previously European) Cordless Telephone) was defined on the initiative of European companies, with the aim of specifying a standard for a universal high-performance air interface. The DECT standard is described in the documents ETS (European Telecommunication Standard) 300 175-1, ..., 9 October 1992 of the ETSI (European Telecommunication Standards Institute) and is known from these.

A DECT system allows a maximum of 120 simultaneous connections between so-called fixed parts and portable parts by which, incidentally, is meant not only mobile terminals but, as for example in the case of the wireless line interface system "Radio in the Local Loop", also stationary system components communicating with a fixed part via air interface, which include the functionality of a portable part~~,~~. ~~in~~ In which system a maximum of 10 frequencies between 1.88 and

1.90 GHz are available and a maximum of 12 simultaneous duplex voice links (time slots, voice channels) can be implemented for each frequency.

The DECT standard also specifies interworking between DECT and "ISDN" (Integrated Services Digital Network). For this reason, time slots with a 64 kbit/s transmission rate, intended as support for ISDN, are also specified in addition to the time slots (channels) with 32 kbit/s ("Full Slots") and 8 kbit/s ("Half Slots") required for voice links.

Fixed parts and corresponding portable parts are generally known which support transmission rates of both 32 kbit/s "Full Slots" and 64 kbit/s "Double Slots" for the faster data transmission of, for example, 64 kbit/s or, respectively, for supporting DECT/ISDN interworking, which thus provide up to six channels with a transmission rate of 64 kbit/s; i.e., a maximum of two complete ISDN connections consisting of two "B channel" basic channels with 64 kbit/s each and one "D channel" control channel with 16 kbit/s.

These fixed parts are integrated into preexisting cordless telecommunication, RLL or WLL systems. Where there is a requirement for high transmission rates, particularly for packet data transmission, this integration is done by substituting fixed parts which support both 32 kbit/s time slots (full slots) and 64 kbit/s time slots (double slots) for the fixed parts which only provide time slots of 32 kbit/s. A problem arising with this procedure is the fact that fully functional fixed parts are removed from existing networks or radiotelecommunication systems even though their procurement costs have not yet been amortized in some cases.

After the substitution, the availability of full-slot connections and double-slot connections is guaranteed, in principle;. ~~however~~ However, if there is a large number of existing full-slot connections, the case may occur that requested double-slot connections cannot be implemented since, due to the existing full-slot connections, it is not possible to form time slots with 64 kbit/s transmission rate (double slot). In this case, channels for services having a requirement for high transmission rates, especially the transmission of packet data, can only be provided again when the number of existing full-slot connections has been reduced.

From US 4,748,681, a telecommunication system is known in which a fixed part is, in each case, operated in a radio cell~~,~~. ~~the~~ The radio cells in each case ~~exhibiting~~ exhibit a multiplicity of different portable parts which need different services and the fixed part at least partially ~~supporting~~ supports these different services and ~~informing~~ informs the portable parts ~~by means of~~ via signaling of the services supported.

The present invention is ~~based on the object of~~ directed toward specifying a method for controlling the distribution of transmission rates in a cellular radiotelecommunication system in which the radio transmission resources available in the radiotelecommunication system, especially with an RLL or WLL system, respectively, are effectively used.

~~This object is achieved by the features of patent claim 1.~~

SUMMARY OF THE INVENTION

~~In~~ Accordingly, in the method according to the present invention, ~~according to claim 1~~ a second fixed part which supports the first transmission rate is, in each case, additionally installed in the radio cell in a cellular telecommunication system having at least one radio cell with a first fixed part which supports a first low transmission rate and a second transmission rate and at least one portable part for purposes of cordless telecommunication, especially in accordance with the TDMA principle~~,~~. ~~the~~ The second fixed part ~~signaling~~ signals the support of the first transmission rate in a first system information item and the first fixed part ~~signaling~~ signals the support of the second or of the first and second transmission rate depending on traffic.

The essential advantage of the method according to the present invention is the possibility of using the second fixed part exclusively for implementing connections having a low transmission rate and the first fixed part predominantly for implementing connections having a high transmission rate so that adequate supply with time slots of high transmission rate is guaranteed within the radio cell.

~~In the advantageous~~ a further ~~development~~ embodiment, ~~according to claim 2~~ two lists are maintained in a portable part which supports both the first

transmission rate for providing the first service and a second transmission rate for providing the second service. If it is signaled to a portable part in the system information item of a fixed part that the latter supports the first transmission mode, connection-related data, especially the identification of the fixed part, obtained from the system information are stored in a first list. If the fixed part signals to the portable part that it supports the second transmission mode, the connection-related data, especially the identification of the fixed part, are stored in a second list ~~claim 2~~.

~~The~~ An advantage of this further ~~development~~ embodiment is that the fixed parts are differentiated in accordance with the services provided~~,~~ in order to guarantee better utilization of the available services.

An essential advantage of ~~the~~ further ~~development in claim 3~~ embodiments relating to both ~~(~~decentralized traffic-dependent control~~)~~ and ~~claim 4 (~~centralized traffic-dependent control) is the efficient utilization of the available services since the fixed part which supports services with high transmission rates is kept free of services with low transmission rates ~~by means of~~ via suitable signaling.

~~The~~ An essential advantage of ~~the further development in claim 5~~ another embodiment is to keep the first fixed part free for telecommunication connections utilizing the second service by exchanging the telecommunication connection between the first fixed part and the portable part utilizing the first service against an equivalent telecommunication connection to the second fixed part.

~~The essential~~ An advantage of ~~the~~ a further ~~development in claim 6~~ embodiment is time stabilization of the method since the hysteresis achieved ~~by means of~~ via the threshold values prevents the system information from continuously flipping.

~~The essential advantage of the further development of claim 7 is~~ Another embodiment allows for the resultant possibility of use in a DECT system.

~~The essential advantage of the further development of claim 8 is~~ Yet another embodiments for the resultant possibility of use in a GSM system.

~~The essential advantage of the further development of claim 10 is~~ In another embodiment, the simple and inexpensive implementation of the method is effected since the exchange of telecommunication connections is performed without additional measurements and signaling operations.

~~The essential~~ An advantage of ~~the~~ a further ~~development of claim 11~~ embodiment is an increase in the effective utilization of available services since the first fixed part is rapidly freed for telecommunication connections utilizing the second service with the second transmission rate, due to the rapid exchange of the telecommunication connections.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

~~Further advantageous embodiments of the invention are specified in the remaining subclaims.~~

~~An exemplary embodiment of the invention will be explained with reference to figures 1 and 2, in which:~~

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows two radio cells of a DECT system with, in each case, one portable part and two fixed parts and a higher-level controller~~,~~.

Figure 2 shows a flowchart for controlling the traffic-dependent distribution of the transmission rates in fixed parts in the DECT system according to ~~figure~~ Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 shows a telecommunication system constructed as a DECT system, with radio cells PC1 and PC2 constructed as picocells. Information is transmitted in each case via a DECT air interface designed in accordance with the DECT standard, via which the wireless "DECT radio channel" transmission medium is accessed by a combination of FDMA (Frequency Division Multiple Access), TDMA (Time Division Multiple Access) and TDD (Time Division Duplex) access methods. In this system, ten carrier frequencies with a channel spacing of, in each

case, 1.728 MHz (FDMA) are available in the frequency range between 1880 MHz and 1900 MHz, the time frame established per carrier being divided into 24 time slots or channels (also called "slots" (TDMA)).

During the transmission of voice data, DECT fixed parts FP11, FP12, FP21, FP22 use time slots with 32 kbit/s transmission rate (full slots), whereas time slots having a transmission rate of 64 kbit/s (double slots) are mainly used for the transmission of packet data by ~~in each case~~ first DECT fixed parts FP11, FP21. A first DECT portable part PP21 uses full slots for transmitting voice data, whereas a second DECT portable part PP11 uses full slots for voice transmission and double slots for the transmission of packet data. The second DECT portable part PP11 stores data records from the DECT fixed parts FP11, FP12, FP21, FP22 which use full slots and the DECT fixed parts FP11, FP12, FP21, FP22 which use double slots, in the form of separate lists L1, L2 in a memory SP1, SP2. A controller FPC, which is connected to the DECT fixed parts FP11, FP12, FP21, FP22 via a line in order to control them in dependence on the traffic, is superordinate to the radio cells PC1 and PC2.

As an alternative, the connection between DECT fixed parts FP11, FP12, FP21, FP22 and the controller FPC ~~can~~ also can be implemented via the DECT air interface.

The DECT system ~~can~~ also can be implemented without controller; i.e., the traffic-dependent control is implemented by the fixed parts FP11, FP12, FP21, FP22.

The flowchart shown in ~~figure~~ Figure 2 illustrates the sequence of traffic-dependent control which takes place in the DECT system according to ~~figure~~ Figure 1 between a first DECT fixed part FP11, a second DECT fixed part FP12, the higher-level controller FPC and the DECT portable part PP11 within the picocell PC1 in dependence on a value FS of the traffic load which has been detected by the second DECT fixed part FP12.

In the initial state, the second fixed part FP12 signals to the second portable part PP11 in a second system information item that it supports full slots and the

first fixed part FP11 signals to the second DECT portable part PP11 in a first system information item that it supports double slots. Signaling is carried out in each case, for example, by setting and resetting flags.

If the second DECT portable part PP11 finds from the flag set or, respectively, reset in the first system information item that the first DECT fixed part FP11 supports a transmission mode M2, (i.e., use of double slots for transmitting, for example, packet data), the second DECT portable part PP11 stores connection-related data from this system information item, for example, among other things, the identification of the DECT fixed part FP11, in the form of a first list L1. If the second DECT fixed part FP12 signals to the second DECT portable part PP11 in the second system information item that it supports a transmission mode M1, i.e. full slots, for transmitting voice, the second DECT portable part PP11 stores connection-related data from this system information item, for example, among other things, the identification of the DECT fixed part, in the form of a second list L2. The lists L1, L2 are updated by a change in the system information items.

If the number FS of the full slots used by the second DECT fixed part FP12 is greater than or equal to a first threshold value FS_MAX which, together with a second threshold value FS_HY, is determined, e.g. centrally in an information and operation center, or locally in the relevant DECT fixed parts FP11, FP21, the second DECT fixed part FP12 sends a first signaling information item to the controller FPC. The first DECT fixed part FP11 is thereupon controlled by the higher-level controller FPC in such a manner that it signals in the first system information item directed to the second DECT portable part PP11 located in the radio cell PC1 that it supports both full slots and double slots. After having received this system information item, the second DECT portable part PP11 updates its list(s) L1, L2.

If the number FS is smaller than the first threshold value FS_MAX, the second DECT fixed part FP12 checks whether the number FS is less than the second threshold value FS_HY. If this is so, the second DECT fixed part FP12 sends a second signaling information item to the higher-level controller FPC. The

first DECT fixed part FP11 is thereupon controlled by the higher-level controller FPC in such a manner that it signals the support of double slots to the second portable part PP11. After having received this system information item, the second DECT portable part PP11 updates the lists L1, L2, if necessary. In addition, the controller FPC requests the first DECT fixed part FP11 to determine the number of existing full-slot connections (transmission mode M1) between the first DECT fixed part FP11 and the DECT portable parts PP11, PP21 and, if these exist, to report them. If there is at least one full-slot connection, the controller FPC can initiate the handover of a full-slot connection from the first DECT fixed part FP11 to the second DECT fixed part FP12 ~~by means of~~ via the second DECT portable part PP11.

If the number is not less than the second threshold value FS_HY or if there is no full-slot connection between the first DECT fixed part FP11 and the second DECT portable part PP11, only the lists L1, L2 of the second DECT portable part are updated, as necessary, and the process recommences with the current number FS.

As an alternative to centralized control by the controller FPC, the traffic-dependent control ~~can~~ also can be performed by the DECT fixed parts FP11, FP12, FP21, FP22 as already described with ~~figure~~ Figure 1. In this case, the second DECT fixed parts FP12, FP22 ~~in each case~~ determine the current value of the number FS, perform the threshold value comparisons and signal the results to the first DECT fixed parts FP11, FP21, ~~in each case and the~~ The first DECT fixed parts FP11, FP21 ~~in each case~~ signal the corresponding transmission modes to the DECT portable parts PP11, PP21 and, if necessary, initiate a handover.

As an alternative to the iterative handover procedure of ~~in each case~~ only one full-slot connection, a number of full-slot connections can be handed over in one step. ~~but the~~ The number of connections is limited, however, to such an extent that the first threshold value FS_MAX is not reached or exceeded by the handover.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made

thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

~~Abstract~~

ABSTRACT OF THE DISCLOSURE

~~Method~~ A method for controlling the distribution of transmission rates in a cellular radiotelecommunication system wherein, ~~In~~ in order to support the effective utilization of types of time slot in wireless telecommunication systems, e.g. the DECT-specific "Full" or "Double Slots", two fixed parts ~~(FP11..FP22)~~ are provided for each radio cell ~~(PC1, PC2)~~. The first fixed parts ~~(FP11, FP21)~~ in each case support two types of time slot but signal in dependence on the capacity utilization of the second fixed parts ~~(FP12, FP22)~~ ~~in each case~~, which only support one type of time slot, that they support the second or the first and second type of time slot. The portable parts ~~(PP11)~~ store the fixed parts ~~(FP11..FP22)~~, after they have signaled their support of types of time slot, in separate lists.

~~Figure 2~~

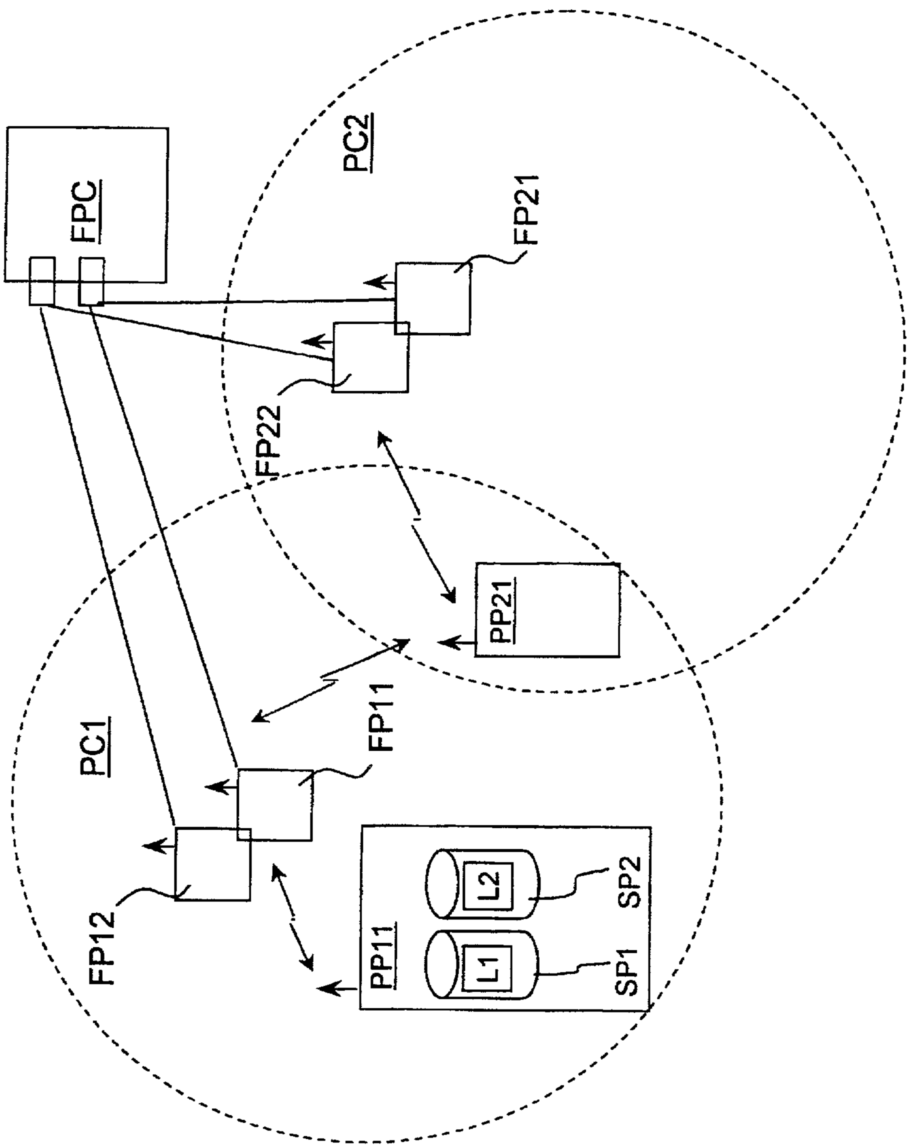

FIG 1

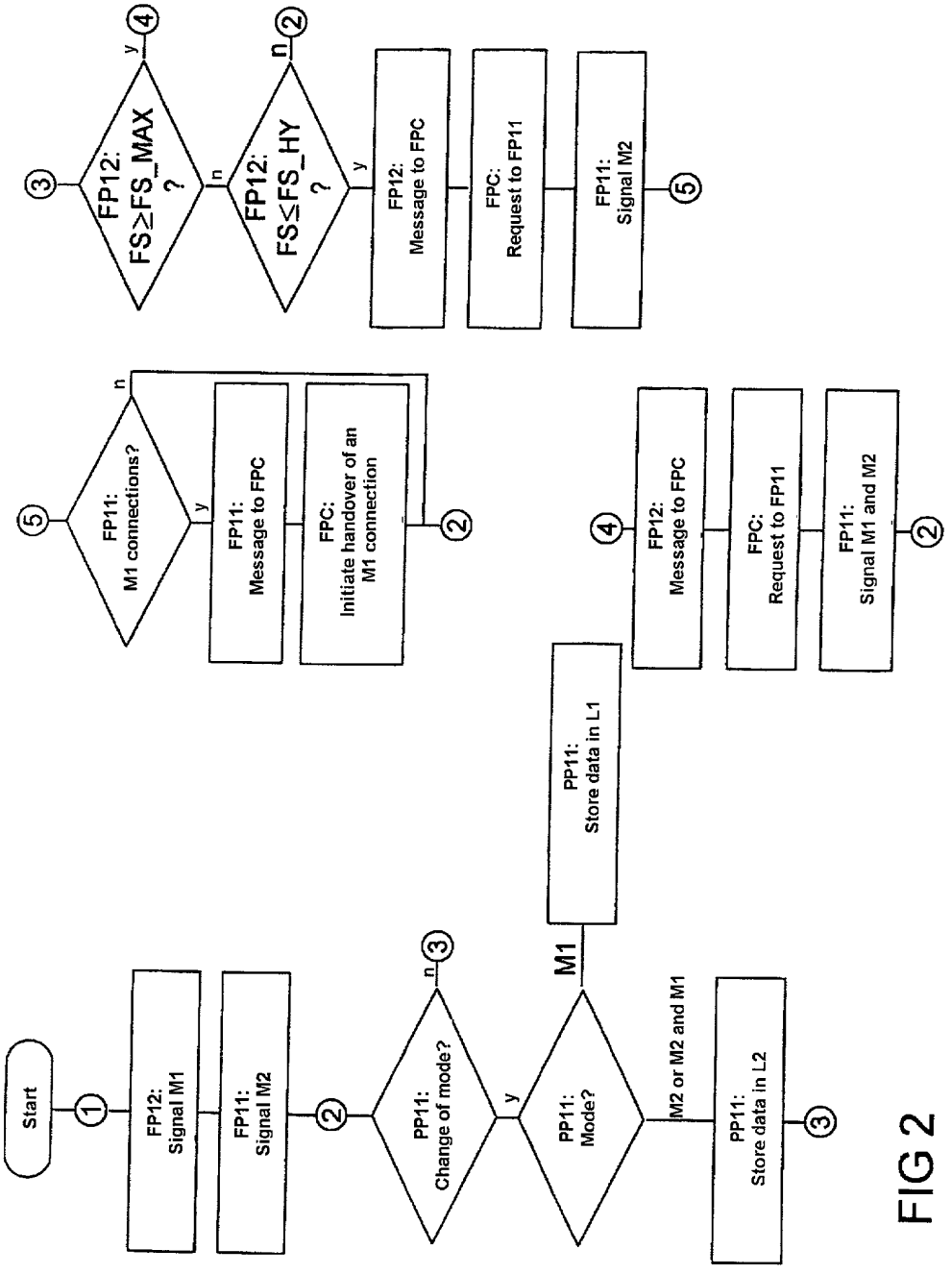
Start
FP12: Signal M1
FP11: Signal M2
PP11: Change of mode?
n
y
PP11: Mode?
M1
M2 or M2 and M1
PP11: Store data in L1
PP11: Store data in L2
FP11: M1 connections?
n
y
FP11: Message to FPC
FPC: Initiate handover of an M1 connection
FP12: Message to FPC
FPC: Request to FP11
FP11: Signal M1 and M2
FP12: FS≥FS_MAX ?
y
n
FP12: FS≤FS_HY ?
n
y
FP12: Message to FPC
FPC: Request to FP11
FP11: Signal M2

FIG 2

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Description

2/prts

Method for controlling the distribution of transmission rates in a cellular radiotelecommunication system

In the field of telecommunication close to the terminal, radio links are increasingly gaining in importance. Cordless telephones, mobile radio terminals and the wireless "RLL" (Radio in the Local Loop) or "WLL" (Wireless Local Loop) line interfacing systems are known examples of this. An air interface known as "DECT" (Digital Enhanced (previously European) Cordless Telephone) was defined on the initiative of European companies, with the aim of specifying a standard for a universal high-performance air interface. The DECT standard is described in the documents ETS (European Telecommunication Standard) 300 175-1, ..., 9 October 1992 of the ETSI (European Telecommunication Standards Institute) and is known from these.

A DECT system allows a maximum of 120 simultaneous connections between so-called fixed parts and portable parts - by which, incidentally, is meant not only mobile terminals but, as for example in the case of the wireless line interface system "Radio in the Local Loop", also stationary system components communicating with a fixed part via air interface, which include the functionality of a portable part -, in which system a maximum of 10 frequencies between 1.88 and 1.90 GHz are available and a maximum of 12 simultaneous duplex voice links (time slots, voice channels) can be implemented for each frequency.

The DECT standard also specifies interworking between DECT and "ISDN" (Integrated Services Digital Network). For this reason, time slots with 64 kbit/s transmission rate, intended as support for ISDN, are also specified in addition

to the time slots (channels) with 32 kbit/s ("Full Slots") and 8 kbit/s ("Half Slots") required for voice links.

Fixed parts and corresponding portable parts are generally known which support transmission rates of both 32 kbit/s "Full Slots" and 64 kbit/s "Double Slots" for the faster data transmission of, for example, 64 kbit/s or, respectively, for supporting DECT/ISDN interworking, which thus provide up to six channels with a transmission rate of 64 kbit/s - i.e. a maximum of two complete ISDN connections consisting of two "B channel" basic channels with 64 kbit/s each and one "D channel" control channel with 16 kbit/s.

These fixed parts are integrated into preexisting cordless telecommunication, RLL or WLL systems. Where there is a requirement for high transmission rates, particularly for packet data transmission, this integration is done by substituting fixed parts which support both 32 kbit/s time slots (full slots) and 64 kbit/s time slots (double slots) for the fixed parts which only provide time slots of 32 kbit/s. A problem arising with this procedure is the fact that fully functional fixed parts are removed from existing networks or radiotelecommunication systems even though their procurement costs have not yet been amortized in some cases.

After the substitution, the availability of full-slot connections and double-slot connections is guaranteed, in principle; however, if there is a large number of existing full-slot connections, the case may occur that requested double-slot connections cannot be implemented since, due to the existing full-slot connections, it is not possible to form time slots with 64 kbit/s

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transmission rate (double slot). In this case, channels for services having a requirement for high transmission rates, especially the transmission of packet data, can only be provided again when the number of existing full-slot connections has been reduced.

From US 4,748,681, a telecommunication system is known in which a fixed part is in each case operated in a radio cell, the radio cells in each case exhibiting a multiplicity of different portable parts which need different services and the fixed part at least partially supporting these different services and informing the portable parts by means of signaling of the services supported.

The invention is based on the object of specifying a method for controlling the distribution of transmission rates in a cellular radiotelecommunication system in which the radio transmission resources available in the radiotelecommunication system, especially with an RLL or WLL system, respectively, are effectively used.

This object is achieved by the features of patent claim 1.

In the method according to the invention - according to claim 1 - a second fixed part which supports the first transmission rate is in each case additionally installed in the radio cell in a cellular telecommunication system having at least one radio cell with a first fixed part which supports a first low transmission rate and a second transmission rate and at least one portable part for purposes of cordless telecommunication, especially in accordance with the TDMA principle, the second fixed part signaling the support of the first transmission rate in a first

system information item and the first fixed part signaling the support of the second or of the first and second transmission rate depending on traffic.

The essential advantage of the method according to the invention is the possibility of using the second fixed part exclusively for implementing connections having a low transmission rate and the first fixed part predominantly for implementing connections having a high transmission rate so that

adequate supply with time slots of high transmission rate is guaranteed within the radio cell.

In the advantageous further development - according to claim 2 - two lists are maintained in a portable part which supports both the first transmission rate for providing the first service and a second transmission rate for providing the second service. If it is signaled to a portable part in the system information item of a fixed part that the latter supports the first transmission mode, connection-related data, especially the identification of the fixed part, obtained from the system information are stored in a first list. If the fixed part signals to the portable part that it supports the second transmission mode, the connection-related data, especially the identification of the fixed part, are stored in a second list - claim 2.

The advantage of this further development is that the fixed parts are differentiated in accordance with the services provided, in order to guarantee better utilization of the available services.

An essential advantage of the further development in claim 3 (decentralized traffic-dependent control) and claim 4 (centralized traffic-dependent control) is the efficient utilization of the available services since the fixed part which supports services with high transmission rates is kept free of services with low transmission rates by means of suitable signaling.

The essential advantage of the further development in claim 5 is to keep the first fixed part free for telecommunication connections utilizing the second service by exchanging the telecommunication

connection between the first fixed part and the portable part utilizing the first service against an equivalent telecommunication connection to the second fixed part.

The essential advantage of the further development in claim 6 is time stabilization of the method since the hysteresis achieved by means of the threshold values prevents the system information from continuously flipping.

The essential advantage of the further development of claim 7 is the resultant possibility of use in a DECT system.

The essential advantage of the further development of claim 8 is the resultant possibility of use in a GSM system.

The essential advantage of the further development of claim 10 is the simple and inexpensive implementation of the method since the exchange of telecommunication connections is performed without additional measurements and signaling operations.

The essential advantage of the further development of claim 11 is increase in the effective utilization of available services since the first fixed part is rapidly freed for telecommunication connections utilizing the second service with the second transmission rate, due to the rapid exchange of the telecommunication connections.

Further advantageous embodiments of the invention are specified in the remaining subclaims.

An exemplary embodiment of the invention will be explained with reference to figures 1 and 2, in which:

Figure 1 shows two radio cells of a DECT system with in each case one portable part and two fixed parts and a higher-level controller,

Figure 2 shows a flowchart for controlling the traffic-dependent distribution of the transmission rates in fixed parts in the DECT system according to figure 1.

Figure 1 shows a telecommunication system constructed as DECT system, with radio cells PC1 and PC2 constructed as picocells. Information is transmitted in each case via a DECT air interface designed in accordance with the DECT standard, via which the wireless "DECT radio channel" transmission medium is accessed by a combination of FDMA (Frequency Division Multiple Access), TDMA (Time Division Multiple Access) and TDD (Time Division Duplex) access methods. In this system, ten carrier frequencies with a channel spacing of in each case 1.728 MHz (FDMA) are available in the frequency range between 1880 MHz and 1900 MHz, the time frame established per carrier being divided into 24 time slots or channels - also called "slots" (TDMA).

During the transmission of voice data, DECT fixed parts FP11, FP12, FP21, FP22 use time slots with 32 kbit/s transmission rate (full slots), whereas time slots having a transmission rate of 64 kbit/s (double slots) are mainly used for the transmission of packet data by in each case first DECT fixed parts FP11, FP21. A first DECT portable part PP21 uses full slots for transmitting voice data, whereas a second DECT portable part PP11 uses full slots for voice transmission and double slots for the transmission of packet data. The second DECT portable part PP11 stores data records from the DECT fixed parts FP11, FP12, FP21, FP22

which use full slots and the DECT fixed parts FP11, FP21, which use double slots, in the form of separate lists L1, L2 in a memory SP1, SP2. A controller FPC, which is connected to the DECT fixed parts FP11, FP12, FP21, FP22 via a line in order to control them in dependence on the traffic, is superordinate to the radio cells PC1 and PC2.

As an alternative, the connection between DECT fixed parts FP11, FP12, FP21, FP22 and the controller FPC can also be implemented via the DECT air interface.

The DECT system can also be implemented without controller; i.e. the traffic-dependent control is implemented by the fixed parts FP11, FP12, FP21, FP22.

The flowchart shown in figure 2 illustrates the sequence of traffic-dependent control which takes place in the DECT system according to figure 1 between a first DECT fixed part FP11, a second DECT fixed part FP12, the higher-level controller FPC and the DECT portable part PP11 within the picocell PC1 in dependence on a value FS of the traffic load which has been detected by the second DECT fixed part FP12.

In the initial state, the second fixed part FP12 signals to the second portable part PP11 in a second system information item that it supports full slots and the first fixed part FP11 signals to the second DECT portable part PP11 in a first system information item that it supports double slots. Signaling is carried out in each case, for example, by setting and resetting flags.

If the second DECT portable part PP11 finds from the flag set or, respectively, reset in the first system information item that the first DECT fixed part FP11 supports

a transmission mode M2, i.e. use of double slots for transmitting, for example, packet data, the second DECT portable part PP11 stores connection-related data from this system information item, for example, among other things, the identification of the DECT fixed part FP11, in the form of a first list L1. If the second DECT fixed part FP12 signals to the second DECT portable part PP11 in the second system information item that it supports a transmission mode M1, i.e. full slots, for transmitting voice, the second DECT portable part PP11 stores connection-related data from this system information item, for example, among other things, the identification of the DECT fixed part, in the form of a second list L2. The lists L1, L2 are updated by a change in the system information items.

If the number FS of the full slots used by the second DECT fixed part FP12 is greater than or equal to a first threshold value FS_MAX which, together with a second threshold value FS_HY, is determined, e.g. centrally in an information and operation center, or locally in the relevant DECT fixed parts FP11, FP21, the second DECT fixed part FP12 sends a first signaling information item to the controller FPC. The first DECT fixed part FP11 is thereupon controlled by the higher-level controller FPC in such a manner that it signals in the first system information item directed to the second DECT portable part PP11 located in the radio cell PC1 that it supports both full slots and double slots. After having received this system information item, the second DECT portable part PP11 updates its list(s) L1, L2.

If the number FS is smaller than the first threshold value FS_MAX, the second DECT fixed part FP12 checks whether the number FS is less than the second threshold value FS_HY. If this is so, the second DECT fixed part FP12 sends a second signaling information item to the higher-level

controller FPC. The first DECT fixed part FP11 is thereupon controlled by the higher-level controller FPC in such a manner that it signals the support of double slots to the second portable part PP11. After having received this system information item, the second DECT portable part PP11 updates the lists L1, L2 if necessary. In addition, the controller FPC requests the first DECT fixed part FP11 to determine the number of existing full-slot connections (transmission mode M1) between the first DECT fixed part FP11 and the DECT portable parts PP11, PP21 and - if these exist - to report them. If there is at least one full-slot connection, the controller FPC can initiate the handover of a full-slot connection from the first DECT fixed part FP11 to the second DECT fixed part FP12 by means of the second DECT portable part PP11.

If the number is not less than the second threshold value FS_HY or if there is no full-slot connection between the first DECT fixed part FP11 and the second DECT portable part PP11, only the lists L1, L2 of the second DECT portable part are updated, as necessary, and the process recommences with the current number FS.

As an alternative to centralized control by the controller FPC, the traffic-dependent control can also be performed by the DECT fixed parts FP11, FP12, FP21, FP22 as already described with figure 1. In this case the second DECT fixed parts FP12, FP22 in each case determine the current value of the number FS, perform the threshold value comparisons and signal the results to the first DECT fixed parts FP11, FP21 in each case and the first DECT fixed parts FP11, FP21 in each case signal the corresponding transmission modes to the DECT portable parts PP11, PP21 and, if necessary, initiate a handover.

As an alternative to the iterative handover procedure of in each case only one full-slot connection, a number of full-slot connections can be handed over in one step but the number of connections is limited to such an extent that the first threshold value FS_MAX is not reached or exceeded by the handover.

Patent claims

1. A method for controlling the distribution of transmission rates in a cellular radiotelecommunication system, having the following features:

   a) In at least one radio cell (PC1; PC2) of the radiotelecommunication system, in each case at least two fixed parts (FP11, FP12; FP21, FP22) and at least one portable part (PP11; PP12) are operated for purposes of wireless telecommunication,

   b) a first fixed part (FP11; FP21) supports a first transmission mode (M1) in which a first service is transmitted at a first transmission rate, and a second transmission mode (M2) in which a second service is transmitted at a second transmission rate,

   c) a second fixed part (FP12; FP22) supports the first transmission mode (M1) in which the first service is transmitted at the first transmission rate,

   d) the first fixed part (FP11; FP21) signals to the portable part (PP11; PP21), in dependence on a traffic load carried by the second fixed part (FP12; FP22), in a first system information item that it supports the second transmission mode (M2) or the first transmission mode (M1) and second transmission mode (M2),

   e) the second fixed part (FP12; FP22) signals to the portable part (PP11; PP21) in a second system information item that it supports the first transmission mode (M1).

2. The method as claimed in claim 1, characterized in that

a) the portable part (PP11; PP21) supports the first transmission mode (M1) in which the first service is transmitted at the first transmission rate, and the second transmission

mode (M2) in which the second service is transmitted at the second transmission rate,

b) the portable part (PP11; PP21) stores connection-related data in at least one memory (SP1, SP2),

c) the portable part (PP11; PP21) stores primary data records in the form of a first list (L1) in the memory (SP1, SP2) when the fixed parts (FP11, FP12, FP21, FP22) signal in the system information item that they support the first transmission mode (M1),

d) the portable part (PP11; PP21) stores secondary data records in the form of a second list (L2) in the memory (SP1, SP2) when the fixed parts (FP11, FP12, FP21, FP22) signal in the system information item that they support the second transmission mode (M2),

e) the portable part (PP11; PP21) updates the first list (L1) and the second list (L2) in the case of a change in the system information from the fixed parts (FP11, FP12, FP21, FP22).

3. The method as claimed in claim 1 or 2, characterized in that

a) the second fixed part (FP12; FP22) compares value (FS) of the current capacity utilization with threshold values (FS_MAX, FS_HY),

b) the second fixed part (FP12, FP22) sends to the first fixed part (FP11, FP21) a first signaling information item when the value (FS) of the current capacity utilization is greater than or equal to a first threshold value (FS_MAX),

c) the second fixed part (FP12, FP22) sends to the first fixed part (FP11, FP21) a second signaling information item when the value (FS) of the current capacity utilization is less than or equal to a second threshold value (FS_HY),

d) the first fixed part (FP11; FP21) signals, between receiving the first and the second signaling information items, to the portable part (PP11; PP21) in the first system information

item that it supports the first transmission mode (M1) and the second transmission mode (M2),

e) the first fixed part (FP11; FP21) signals, between receiving the second and first signaling information items, to the portable part (PP11; PP21) in the first system information item that it supports the second transmission mode (M2) or the first transmission mode (M1) and the second transmission mode (M2).

4. The method as claimed in claim 1 or 2, characterized in that

a) the second fixed part (FP12; FP22) compares a value (FS) of the current capacity utilization with threshold values (FS_MAX, FS_HY),

b) the second fixed part (FP12, FP22) sends to a higher-level controller (FPC) a first signaling information item when the value (FS) of the current capacity utilization is greater than or equal to a first threshold value (FS_MAX),

c) the second fixed part (FP12, FP22) sends to the higher-level controller (FPC) a second signaling information item when the value (FS) of the current capacity utilization is less than or equal to a second threshold value (FS_HY),

d) the controller (FPC), between receiving the first and the second signaling information items, controls the first fixed part (FP11; FP21) in such a manner that it signals to the portable part (PP11; PP21) in the first system information item that it supports the first transmission mode (M1) and the second transmission mode (M2),

e) the controller (FPC), between receiving the second and the first signaling information items, controls the first fixed part (FP11; FP21) in such a manner that it signals to the

portable part (PP11; PP21) in the first system information item that it supports the second

transmission mode (M2) or the first transmission mode (M1) and second transmission mode (M2).

5. The method as claimed in claim 3 or 4, characterized in that telecommunication connections between the portable parts (PP11; PP21) and the first fixed part (FP11; FP21), in which the first transmission mode (M1) is used, are exchanged in the sense of a handover by corresponding telecommunication connections between the portable parts (PP11, PP21) and the second fixed part (FP12, FP22).

6. The method as claimed in claim 5, characterized in that

a) the telecommunication connections are exchanged when the second signaling information item is received,

b) the telecommunication connections are exchanged automatically,

c) the exchange of telecommunication connections is ended at the latest after the first signaling information item has been received.

7. The method as claimed in claim 6, characterized in that

a) the portable part (PP11, PP21) initiates the exchange of telecommunication connections,

b) the portable part (PP11, PP21) exchanges the telecommunication connections.

8. The method as claimed in claim 6, characterized in that

a) the higher-level controller (FPC) initiates the exchange of telecommunication connections,

b) the higher-level controller (FPC) exchanges telecommunication connections.

9. The method as claimed in claim 6, characterized in that

a) the fixed part (FP11, FP12, FP21, FP22) initiates the exchange of telecommunication connections,

b) the fixed part (FP11, FP12, FP21, FP22) exchanges the telecommunication connections.

10. The method as claimed in one of claims 5 to 7, characterized in that the telecommunication connections are exchanged in an iterative process.

11. The method as claimed in one of claims 5 to 8, characterized in that

a) a number of connections which can be handed over to the second fixed part (FP11, FP21) without exceeding the first threshold value (FS_MAX) is signaled to the first fixed part (FP11, FP21),

b) the first fixed part (FP11, FP21) hands over, at the most, this number of connections in one step to the second fixed part (FP12, FP22).

12. The method as claimed in claim 10, characterized in that the second fixed part (FP12, FP22) signals the number of connections to the first fixed part (FP11, FP21).

13. The method as claimed in claim 10, characterized in that

a) the second fixed part (FP12, FP22) signals the number of connections to the controller (FPC),

b) the controller (FPC) thereupon signals the number of connections to the first fixed part.

14. The method as claimed in one of claims 3 to 12, characterized in that the absolute value of the second threshold value (FS_HY) is equal to the absolute value of the first threshold value (FS_MAX).

15. The method as claimed in one of claims 3 to 12, characterized in that the absolute value of the second threshold value (FS_HY) is smaller than the absolute value of the first threshold value (FS_MAX).

16. The method as claimed in one of the preceding claims, characterized in that signals are transmitted at 32 kbit/s in the case of the first transmission rate and at 64 kbit/s in the case of the second transmission rate.

17. The method as claimed in one of the preceding claims, characterized in that voice is transmitted in the case of the first service and packet data are transmitted in the case of the second service.

18. The method as claimed in one of the preceding claims, characterized in that the portable part (PP11, PP21) is a wireless portable part.

19. The method as claimed in one of the preceding claims, characterized in that the portable part (PP11, PP21) is a wireless radio network termination RNT.

20. The method as claimed in one of the preceding claims, characterized in that the radiotelecommunication system operates in accordance with the DECT standard.

GR 99 P 1301

Abstract

Method for controlling the distribution of transmission rates in a cellular radiotelecommunication system

In order to support the effective utilization of types of time slot in wireless telecommunication systems - e.g. the DECT-specific "Full" or "Double Slots", two fixed parts (FP11..FP22) are provided for each radio cell (PC1, PC2). The first fixed parts (FP11, FP21) in each case support two types of time slot but signal in dependence on the capacity utilization of the second fixed parts (FP12, FP22) in each case, which only support one type of time slot, that they support the second or the first and second type of time slot. The portable parts (PP11) store the fixed parts (FP11..FP22), after they have signaled their support of types of time slot, in separate lists.

Figure 2

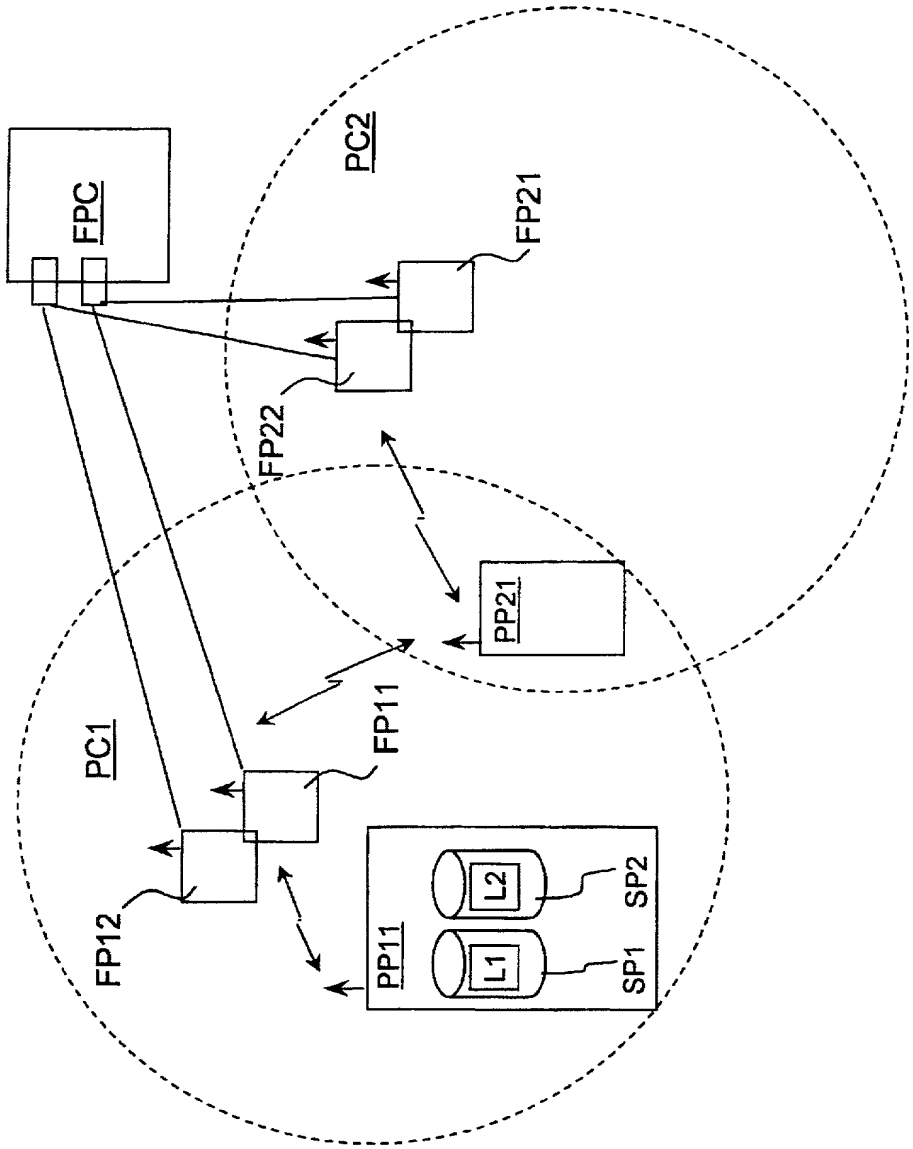

FIG 1

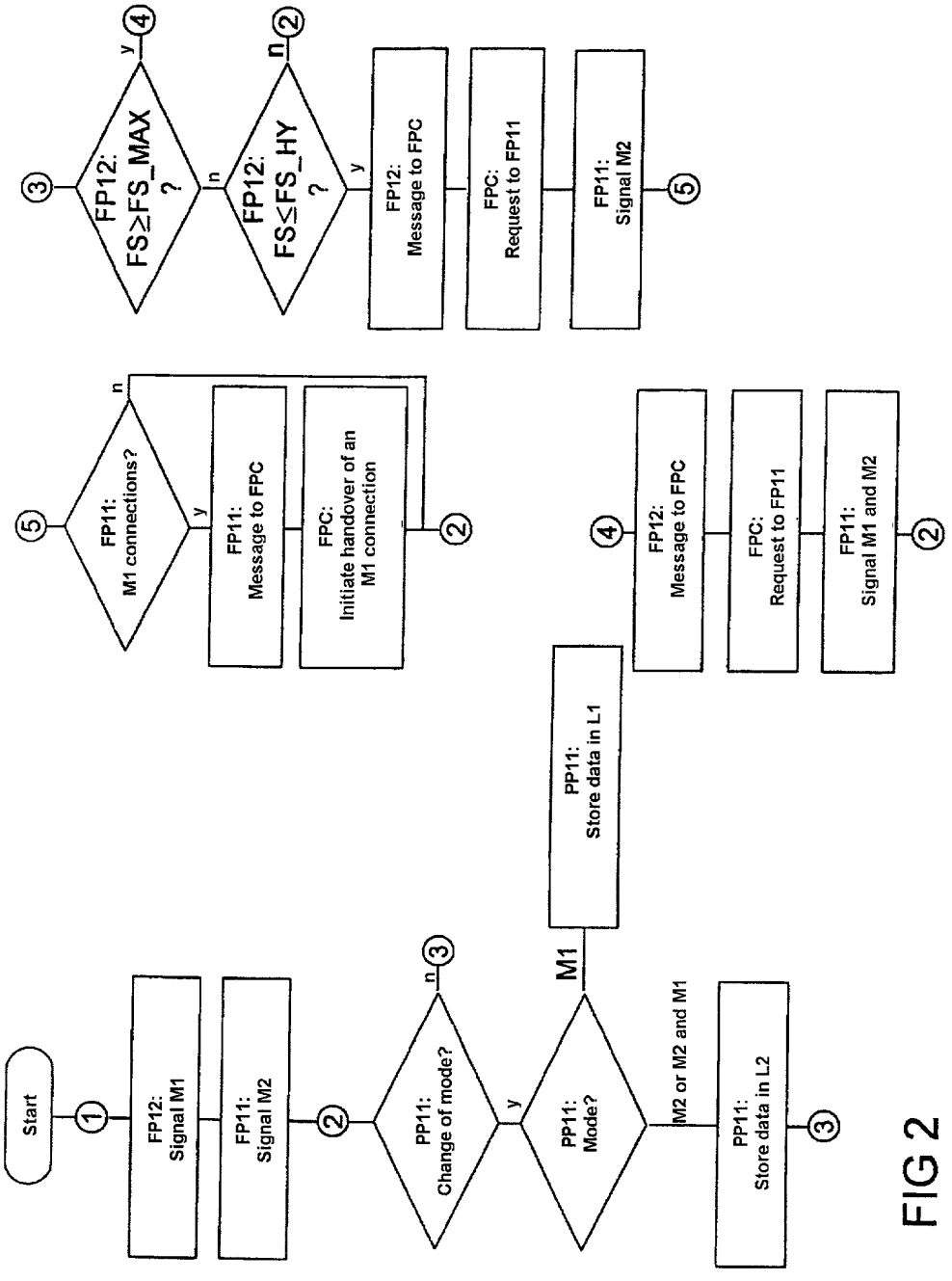

FIG 2

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

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Verfahren zur Steuerung der Aufteilung von Uebertragungsraten in einem zellularen Funk-Telekommunikationssystem

deren Beschreibung

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
☒ am 25.02.2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/00538
eingereicht wurde und am ________
abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Method for controlling the division of transfer rates in a cellular radio telecommunications system

the specification of which

(check one)
☐ is attached hereto.
☒ was filed on 25.02.2000 as
PCT international application
PCT Application No. PCT/DE00/00538
and was amended on ________
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Form PTO-FB-240 (8-83)
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German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
19908424.6	DE	26.02.1999	☒	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/00538	25.02.2000	anhängig	pending
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D, M, Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
_____		_____	
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M; J)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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Voller Name des einzigen oder ursprünglichen Erfinders:	Full name of sole or first inventor:
Dr. EGON SCHULZ	Dr. EGON SCHULZ
Unterschrift des Erfinders Datum Egon Schulz 26/06/07	Inventor's signature Date
Wohnsitz MUENCHEN, DEUTSCHLAND DE	Residence MUENCHEN, GERMANY
Staatsangehörigkeit DE	Citizenship DE
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Voller Name des zweiten Miterfinders (falls zutreffend):	Full name of second joint inventor, if any:
Unterschrift des Erfinders Datum	Second Inventor's signature Date
Wohnsitz ,	Residence ,
Staatsangehörigkeit	Citizenship
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(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).